

SEE EXHIBIT  
A-2.4

text states swale 4 is  
to the east of 5th ave

show Subbasin 3C,  
3D, 3E

update areas to cor-  
respond with areas in  
report


SUBBASIN 3A AREAS

- OVERLAY OR REPAIR (0 ACRES)
- REPLACED IMPERVIOUS (0.97 ACRES)
- NEW IMPERVIOUS (0.15 ACRES)
- CONVERTED IMPERVIOUS (0.04 ACRES)

SUBBASIN 3B AREAS

- OVERLAY OR REPAIR (0 ACRES)
- REPLACED IMPERVIOUS (1.07 ACRES)
- NEW IMPERVIOUS (0.24 ACRES)
- CONVERTED IMPERVIOUS (0.25 ACRES)

SEE EXHIBIT  
A-2.6

FILE NAME c:\pw_working\lochner-sl\joshua.phillips\d0144014\BASIN_EXHIBIT_PROP_2.dgn					REGION NO.		STATE	FED.AID PROJ.NO.  STPUL-0523(011)	<div>PRELIMINARY NOT FOR CONSTRUCTION</div>	<div> <b>LOCHNER</b></div>	SR 523 MP 0.78 TO MP 1.11		Plot 1
TIME 2:15:54 PM					10	WASH	PLAN REF NO <b>A-2.5</b>						
DATE 12/8/2021					JOB NUMBER		SHEET <b>XX</b> OF SHEETS						
PLOTTED BY JOSHUA.PHILLIPS					CONTRACT NO.								
DESIGNED BY J PHILLIPS					XXXXXX								
ENTERED BY XX													
CHECKED BY XX													
PROJ. ENGR. J TUTTLE							KING COUNTY	DECEMBER 2021					
REGIONAL ADM. M COTTEN							PROPOSED BASIN EXHIBIT 2						
REVISION				DATE	BY								





Fill in the data for the grey shaded areas only

Tc =	5.00
C =	0.90
I =	2.39
m=	5.62
n=	0.53

Project Name: SR 523 & I-5 INTERCHANGE IMPROVEMENTS  
Project #: 16242  
S.R.: 523  
Designed By: JP  
Date: 1/5/2021

Standard curb cross section. Assumes Shoreline minimum spacing criteria upto Sta 20+90 (300' from the roundabout center)  
Assumes areas behind the back of curb are captured separately.

additional structure  
needed to reduce Zd

[illegible]

Fill in the data for the grey shaded areas only

Tc =	5.00
C =	0.90
I =	2.39
m =	5.62
n =	0.53

Project Name: SR 523 & I-5 INTERCHANGE IMPROVEMENTS  
Project #: 16242  
S.R.: 523  
Designed By: JP  
Date: #####

[illegible]

Fill in the data for the grey shaded areas only

Tc =	5.00
C =	0.90
I =	2.39
m =	5.62
n =	0.53

Project Name: SR 523 & I-5 INTERCHANGE IMPROVEMENTS  
Project #: 16242  
S.R.: 523  
Designed By: JP  
Date: #####

[illegible]

[illegible]



STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only.  
Please use one spreadsheet per stormsewer run.

Project Name: 145th West - North Side

Designed By: JP  
Project Office: LACEY

m = 5.62 n = 0.53 Design Storm Event = 10 Pavement thickness (ft) = 0.75 Pipe Thickness (inches) = 1.25

Location				Discharge Drain Design														Drain Profile										Remarks			
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum (acre)	T <sub>a</sub> Across Area (minutes)	Total T <sub>c</sub> = Col. 8a + T <sub>c</sub> across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Manning roughness coefficient "n"	Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	
1	2	3	4	5	6	7	8	8a	9	10	11	12	13	14	14a	15	16	17	17a	17b	18	19	20	21	22	23	24	25	26	27	28
145th West	1	2	Road	0.00	0.90	0.00	0.00	5.0	0.0	2.39	0.00	0.00	0.00	12	0.012	0.0477	10.73	8.42	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	248	11.82	379.80	367.98	383.80	371.98	2.15	2.15	More than 2 ft of cover	More than 2 ft of cover	
	2	3	Road	0.31	0.90	0.28	0.28	5.0	5.0	2.39	0.67	0.00	0.67	12	0.012	0.0976	15.35	12.05	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	135	13.18	367.98	354.80	371.98	358.80	2.15	2.15	More than 2 ft of cover	More than 2 ft of cover	
	3	4	Road	0.17	0.90	0.15	0.43	5.0	5.1	2.36	1.01	0.00	1.01	12	0.012	0.1006	15.58	12.23	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	112.5	11.32	354.80	343.48	358.80	347.48	2.15	2.15	More than 2 ft of cover	More than 2 ft of cover	
	4	VAULT	Road	0.14	0.90	0.12	0.55	5.0	5.3	2.33	1.29	0.00	1.29	12	0.012	0.0100	4.91	3.86	VELOCITY OK	ADEQUATE PIPE CAPACITY	35.5	0.36	343.48	343.13	347.48	350.85	2.15	5.87	More than 2 ft of cover	More than 2 ft of cover	
	17	18	Road	0.11	0.90	0.10	0.10	5.0	5.0	2.39	0.23	0.00	0.23	12	0.012	0.0699	12.99	10.19	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	98.9	6.91	336.91	330.00	340.91	337.74	2.15	5.89	More than 2 ft of cover	More than 2 ft of cover	
	25	24	Road	0.12	0.90	0.11	0.11	5.0	5.0	2.39	0.27	0.00	0.27	12	0.012	0.0060	3.81	2.99	VELOCITY OK	ADEQUATE PIPE CAPACITY	49.6	0.30	331.05	330.75	335.51	336.46	2.61	3.85	More than 2 ft of cover	More than 2 ft of cover	
	24	23	Road	0.00	0.90	0.00	0.11	5.0	5.2	2.34	0.27	0.00	0.27	12	0.012	0.0060	3.81	2.99	VELOCITY OK	ADEQUATE PIPE CAPACITY	71.9	0.43	330.75	330.32	336.46	337.68	3.85	5.50	More than 2 ft of cover	More than 2 ft of cover	
	23	18	Road	0.12	0.90	0.11	0.22	5.0	5.5	2.27	0.50	0.00	0.50	12	0.012	0.0127	5.53	4.34	VELOCITY OK	ADEQUATE PIPE CAPACITY	25.3	0.32	330.32	330.00	337.68	337.74	5.50	5.89	More than 2 ft of cover	More than 2 ft of cover	
	18	19	Road	0.18	0.90	0.16	0.16	5.0	5.0	2.39	0.39	0.73	1.13	12	0.012	0.0450	10.42	8.18	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	52.2	2.35	332.94	330.59	337.74	335.39	2.95	2.95	More than 2 ft of cover	More than 2 ft of cover	
	19	20	Road	0.06	0.90	0.06	0.22	5.0	5.1	2.37	0.52	0.00	1.25	12	0.012	0.0339	9.04	7.10	VELOCITY OK	ADEQUATE PIPE CAPACITY	50.2	1.70	330.59	328.89	335.39	332.89	2.95	2.15	More than 2 ft of cover	More than 2 ft of cover	
	20	21	Road	0.03	0.90	0.03	0.25	5.0	5.2	2.35	0.59	0.00	1.32	12	0.012	0.0365	9.39	7.37	VELOCITY OK	ADEQUATE PIPE CAPACITY	50.1	1.83	328.89	327.06	332.89	330.43	2.15	1.52	More than 2 ft of cover	Low Cover - See Notes at Bottom	Downstream is outside driveable area
	21	SWALE	Road	0.03	0.90	0.03	0.28	5.0	5.3	2.33	0.64	0.00	1.37	12	0.012	0.0100	4.92	3.86	VELOCITY OK	ADEQUATE PIPE CAPACITY	45.8	0.46	327.06	326.60	330.43	326.60	1.52	-1.85	Low Cover - See Notes at Bottom	Not Enough Cover - Need to Revise Pipe Elevations	Outlet to swale
s do not show 17 ecting to 18																															
very high velocities, re- duce slope to reduce velocities, add note to Remarks that this is an existing line. Adjust 18- 19 to reduce velocity.																															
Highlighted numbers do not match the profiles.																															
See WSDOT Hydraulic Manual 6-5 for explanation of columns. <a href="https://www.wsdot.wa.gov/Publications/Manuals/M23-03.htm">https://www.wsdot.wa.gov/Publications/Manuals/M23-03.htm</a>																															
This spreadsheet was updated on 11/4/2019.																															
Notes: Column 12 represents inflow from a storm sewer line, branch, an offsite source that flows into the trunk line being analyzed.																															
The conservative assumption is that the flow enters the storm sewer run at the upstream end of the run being analyzed.																															
For pipe cover calculation, Pipe cover = (Ground or Rim Elevation - Pipe invert elevation) - (pavement thickness) - (top of pipe thickness) - (pipe diameter). The pipe thickness is based on the pipe diameter per WSDOT Manual Concrete for Shallow Pipe Cover Installations Fill Height Table 8-12.3 Please specify the largest pipe thickness of the storm sewer run being analyzed.																															
The spreadsheet will only calculate one storm sewer line at a time. Please copy the "Blank Template" and use this for calculating new storm sewer lines. If analyzing complicated stormsewer system with multiple lateral lines to the trunk line, it is recommended that Stormshed be used to model the conveyance system. Please contact your Region Hydraulics Engineer.																															
WARNING: START YOUR STORMSEWER RUN ON ROW 12. DO NOT SKIP ANY ROWS IN BETWEEN. USE ONE SHEET PER STORMSEWER RUN																															
Please report any problems to the WSDOT HQ Hydraulics Section.																															

very high velocities, reduce slope to reduce velocities, add note to Remarks that this is an existing line. Adjust 18-19 to reduce velocity.

Highlighted numbers do not match the profiles.

plans do not show 17 connecting to 18

STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only. Please use one spreadsheet per stormsewer run.

Project Name: 145th East - Both Sides

Designed By: JP  
Project Office: LACEY

m = 5.62n = 0.53Design Storm Event = 10

Pavement thickness (ft) = 0.75

Pipe Thickness (inches) = 1.25

Location			Drain Profile																										Remarks		
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum (acre)	Tc Across Area (minutes)	Total Tc = Col. 8a + Tc across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Discharge Manning roughness coefficient "n"	Drain Design Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length*** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	Remarks
1	2	3	4	5	6	7	8	8a	9	10	11	12	13	14	14a	15	16	17	17a	17b	18	19	20	21	22	23	24	25	26	27	28
145th East	52	53	Road	0.35	0.90	0.31	0.31	5.0	5.0	2.39	0.75	0.00	0.75	12	0.012	0.0390	9.70	7.62	VELOCITY OK	ADEQUATE PIPE CAPACITY	137.9	5.38	324.17	318.79	328.17	322.31	2.15	1.67	More than 2 ft of cover	Low Cover - See Notes at Bottom	
	53	54	Road	0.15	0.90	0.14	0.45	5.0	5.2	2.34	1.06	0.00	1.06	12	0.012	0.0044	3.25	2.55	VELOCITY OK	ADEQUATE PIPE CAPACITY	11.4	0.05	318.79	318.74	322.31	322.00	1.67	1.41	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	
	54	55	Road	0.02	0.90	0.02	0.47	5.0	5.3	2.32	1.09	0.00	1.09	12	0.012	0.0051	3.51	2.75	VELOCITY OK	ADEQUATE PIPE CAPACITY	41.2	0.21	318.74	318.53	322.00	322.46	1.41	2.08	Low Cover - See Notes at Bottom	More than 2 ft of cover	
	55	48	Road	0.16	0.90	0.14	0.61	5.0	5.5	2.28	1.40	0.00	1.40	12	0.012	0.0051	3.49	2.74	VELOCITY OK	ADEQUATE PIPE CAPACITY	53.4	0.27	318.53	318.26	322.46	321.00	2.08	0.89	More than 2 ft of cover	Low Cover - See Notes at Bottom	
	42	43	Road	0.30	0.90	0.27	0.27	5.0	5.0	2.39	0.65	0.00	0.65	12	0.012	0.0203	7.00	5.49	VELOCITY OK	ADEQUATE PIPE CAPACITY	33	0.67	318.02	317.35	321.10	319.94	1.23	0.74	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	
	44	45	Road	0.10	0.90	0.09	0.09	5.0	5.0	2.39	0.20	0.00	0.20	12	0.012	0.0400	9.83	7.71	VELOCITY OK	ADEQUATE PIPE CAPACITY	115.2	4.61	323.14	318.53	327.14	322.37	2.15	1.99	More than 2 ft of cover	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	45	46	Road	0.08	0.90	0.08	0.16	5.0	5.2	2.35	0.38	0.00	0.38	12	0.012	0.0050	3.46	2.71	VELOCITY OK	ADEQUATE PIPE CAPACITY	10.1	0.05	318.53	318.48	322.37	322.06	1.99	1.73	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	46	47	Road	0.01	0.90	0.01	0.17	5.0	5.2	2.34	0.39	0.00	0.39	12	0.012	0.0054	3.62	2.84	VELOCITY OK	ADEQUATE PIPE CAPACITY	20.3	0.11	318.48	318.37	322.06	321.52	1.73	1.30	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	47	48	Road	0.01	0.90	0.01	0.18	5.0	5.3	2.31	0.42	0.00	0.42	12	0.012	0.0047	3.35	2.63	VELOCITY OK	ADEQUATE PIPE CAPACITY	23.6	0.11	318.37	318.26	321.52	321.00	1.30	0.89	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	48	49	Road	0.02	0.90	0.01	0.20	5.0	5.5	2.29	0.45	1.40	1.85	18	0.012	0.0050	4.55	8.04	VELOCITY OK	ADEQUATE PIPE CAPACITY	17.6	0.09	317.76	317.67	321.00	320.71	0.89	0.68	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	49	50	Road	0.02	0.90	0.02	0.21	5.0	5.5	2.27	0.49	0.00	1.88	18	0.012	0.0050	4.55	8.04	VELOCITY OK	ADEQUATE PIPE CAPACITY	26.4	0.13	317.67	317.54	320.71	320.44	0.68	0.55	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	50	51	Road	0.02	0.90	0.02	0.24	5.0	5.6	2.25	0.53	0.00	1.93	18	0.012	0.0050	4.55	8.04	VELOCITY OK	ADEQUATE PIPE CAPACITY	37.7	0.19	317.54	317.35	320.44	320.46	0.55	0.75	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	51	43	Road	0.13	0.90	0.12	0.36	5.0	5.8	2.22	0.79	0.65	2.84	18	0.012	0.0111	6.79	11.99	VELOCITY OK	ADEQUATE PIPE CAPACITY	31.6	0.35	317.35	317.00	320.46	319.94	0.75	0.59	Low Cover - See Notes at Bottom	Low Cover - See Notes at Bottom	Pipe run under sidewalk
	43	SWALE	Road	0.11	0.90	0.10	0.46	5.0	5.6	2.21	1.01	0.00	3.05	18	0.012	0.0050	4.55	8.04	VELOCITY OK	ADEQUATE PIPE CAPACITY	46.4	0.23	317.00	316.72	319.94	316.93	0.59	-2.19	Low Cover - See Notes at Bottom	Not Enough Cover - Need to Revise Pipe Elevations	Pipe outlet to swale

## Mitigated Routing

### Vault 1

Width: 7 ft.  
 Length: 75 ft.  
 Depth: 5 ft.  
 Discharge Structure  
 Riser Height: 4 ft.  
 Riser Diameter: 18 in.  
 Notch Type: Rectangular  
 Notch Width: 0.051 ft.  
 Notch Height: 2.856 ft.  
 Orifice 1 Diameter: 3.25 in. Elevation: 0 ft.  
 Element Flows To:  
 Outlet 1                      Outlet 2

Does not match vault details in the plans.

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.012	0.000	0.000	0.000
0.0556	0.012	0.000	0.067	0.000
0.1111	0.012	0.001	0.095	0.000
0.1667	0.012	0.002	0.117	0.000
0.2222	0.012	0.002	0.135	0.000
0.2778	0.012	0.003	0.151	0.000
0.3333	0.012	0.004	0.165	0.000
0.3889	0.012	0.004	0.178	0.000
0.4444	0.012	0.005	0.191	0.000
0.5000	0.012	0.006	0.202	0.000
0.5556	0.012	0.006	0.213	0.000
0.6111	0.012	0.007	0.224	0.000
0.6667	0.012	0.008	0.234	0.000
0.7222	0.012	0.008	0.243	0.000
0.7778	0.012	0.009	0.252	0.000
0.8333	0.012	0.010	0.261	0.000
0.8889	0.012	0.010	0.270	0.000
0.9444	0.012	0.011	0.278	0.000
1.0000	0.012	0.012	0.286	0.000
1.0556	0.012	0.012	0.294	0.000
1.1111	0.012	0.013	0.302	0.000
1.1667	0.012	0.014	0.310	0.000
1.2222	0.012	0.014	0.320	0.000
1.2778	0.012	0.015	0.332	0.000
1.3333	0.012	0.016	0.344	0.000
1.3889	0.012	0.016	0.357	0.000
1.4444	0.012	0.017	0.370	0.000
1.5000	0.012	0.018	0.384	0.000
1.5556	0.012	0.018	0.398	0.000
1.6111	0.012	0.019	0.413	0.000
1.6667	0.012	0.020	0.427	0.000
1.7222	0.012	0.020	0.442	0.000
1.7778	0.012	0.021	0.457	0.000
1.8333	0.012	0.022	0.472	0.000
1.8889	0.012	0.022	0.486	0.000
1.9444	0.012	0.023	0.501	0.000
2.0000	0.012	0.024	0.516	0.000